

Book Review

Paleomagnetism of Sedimentary Rocks: Process and Interpretation

by Kenneth P. Kodama, Wiley-Blackwell, 2012,

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MAREK LEWANDOWSKI¹

Kenneth P. Kodama, Professor at Lehigh University (Bethlehem, PA, USA), is a well-known researcher, of outstanding experience in the domain of paleomagnetism. Although sedimentary rocks make up less than 10 % of the Earth's crust, they are very important to paleomagnetic studies because of their nearly continuous record of the history of the geomagnetic field. Natural remanent magnetization (NRM), recorded in sediments, enable better understanding of the evolution of sedimentary basins, tectonic processes, environmental changes, or diagenesis, including effects of, for example, hydrocarbon migrations through the rock matrix. There are several key ambiguities in sedimentary paleomagnetism; the one concerning the red beds controversy being the most spectacular example. This and other problems are carefully and comprehensively treated in this book.

The book consists of nine Chapters (with Figures and Tables), a Glossary of Paleomagnetic and Rock Magnetic Acronyms, References, and Index. Some Figures are repeated on the colour Plates. Chapter 1 is a synthesis of sedimentary paleomagnetism, focusing on the importance and reliability of the NRM record. Evidence for high-quality paleomagnetic data, early detrital remanent magnetization, and postdepositional processes affecting NRM are discussed. Acquisition of depositional remanent magnetization (DRM) is explored in Chapter 2. It includes an introduction to

the traditional DRM concept of remanence acquisition for magnetite-bearing and hematite-bearing rocks, followed by discussion on the importance of flocculation on the accuracy of magnetic grains alignment with the ambient geomagnetic vector. Accuracy of a natural syndepositional remanence, laboratory re-deposition experiments for hematite-bearing rocks, and remanence acquisition on sloping beds are also included in this chapter. In line with a natural evolution of natural magnetization, the following Chapter 3 deals with postdepositional remanent magnetization. There is presented the mechanism of postdepositional remanence acquisition and evidence supporting this process. Chapter 4 treats of the evidence, mechanism, and causes of inclination shallowing in sedimentary rocks. There is described a history of laboratory experiments testing the degree of shallowing due to compaction and attempts made to correct the shallowing error. Differences between magnetite-bearing and hematite-bearing rocks are also discussed. Consequently, Chapter 5 is devoted to technics attempting a correction of the inclination error, based on the magnetic anisotropy of sedimentary rocks, initially envisioned by Jackson and his colleagues in 1991. These methods are juxtaposed with an independent elongation-inclination technique, introduced by Tauxe and Kent in 2004. Postdepositional diagenesis and its contribution to origin of chemical remanent magnetization are described in Chapter 6, where the importance of iron sulphides as recorders of NRM in sediments and sedimentary rocks, is underlined. Early diagenesis in terrestrial red beds, in the context of a long-lasting controversy on early vs late origin of NRM; as well

¹ Institute of Geological Sciences, Polish Academy of Sciences, Twarda St. 51/55, 00-818 Warsaw, Poland. E-mail: lemar@igf.edu.pl

as remagnetization caused by different processes as to basinal fluid flow during orogenesis, hydrocarbon migration, or illitization, are also discussed.

Rotation of the remanence vector due to tectonic strain, observed in rocks and in a laboratory, is the subject of Chapter 7. Understanding the mechanism and the contribution of strain-induced remagnetization is critical, since paleomagnetic data from folded rocks are frequently used for timing of tectonic deformation or to prove a stability of NRM components. Environmental dimensions of sedimentary paleomagnetism are explored in Chapter 8. It provides specialized coverage, focusing on two main topics, namely, the biogenic magnetic minerals or magnetosomes as environmental proxies, and the potential of rock magnetic parameters for high-resolution detection of astronomically forced global climate cycles. Techniques applied in environmental magnetism are exemplified by selected case studies. The last chapter, Chapter 9, is designed to bring together most of the major points of the book, including both processes affecting magnetization of sedimentary rocks, as well as techniques, applied to recognize the evolution of NRM, from its origin in

sedimentary basins, to a final destiny, explored today by paleomagnetists.

The book can be read easily and with great interest, particularly by readers being introduced to the subject. Kodama intelligently summarizes achievements in the field of sedimentary paleomagnetism, where he also plays an important role. Besides, this monographic volume well illustrates how much needs to be done in order to elucidate basic problems in sedimentary paleomagnetism, inspiring researchers to undertake new challenges.

Notably, this book has a companion website: <http://www.wiley.com/go/kodama/paleomagnetism> with Figures and Tables from the book. It is always welcome with gratitude by students and lecturers, since an easy access to a book's iconography always helps in the education process.

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